INTERNAL MARKER DEVICE FOR
IDENTIFICATION OF BIOLOGICAL SUBSTANCES
Cherry T. Thomas et al.
Docket No.: UMJ107B

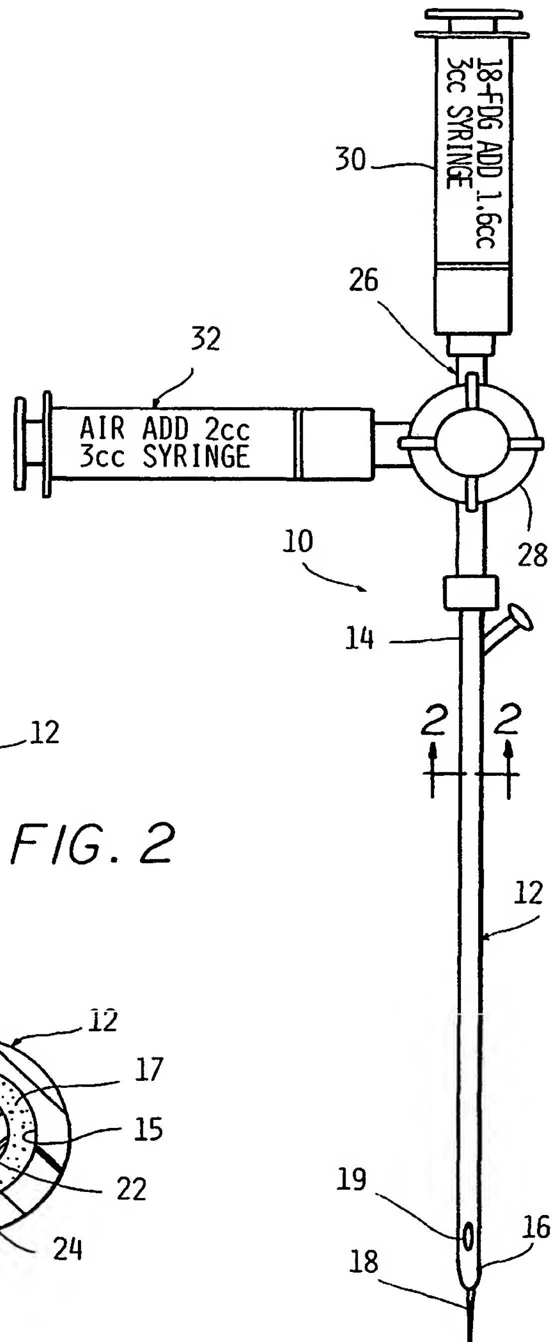


FIG. 1

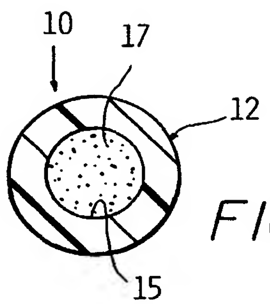


FIG. 2

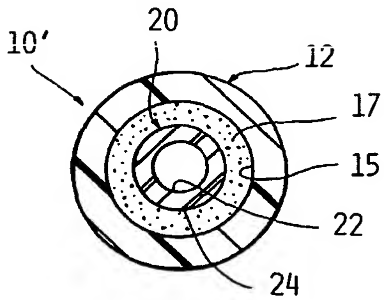
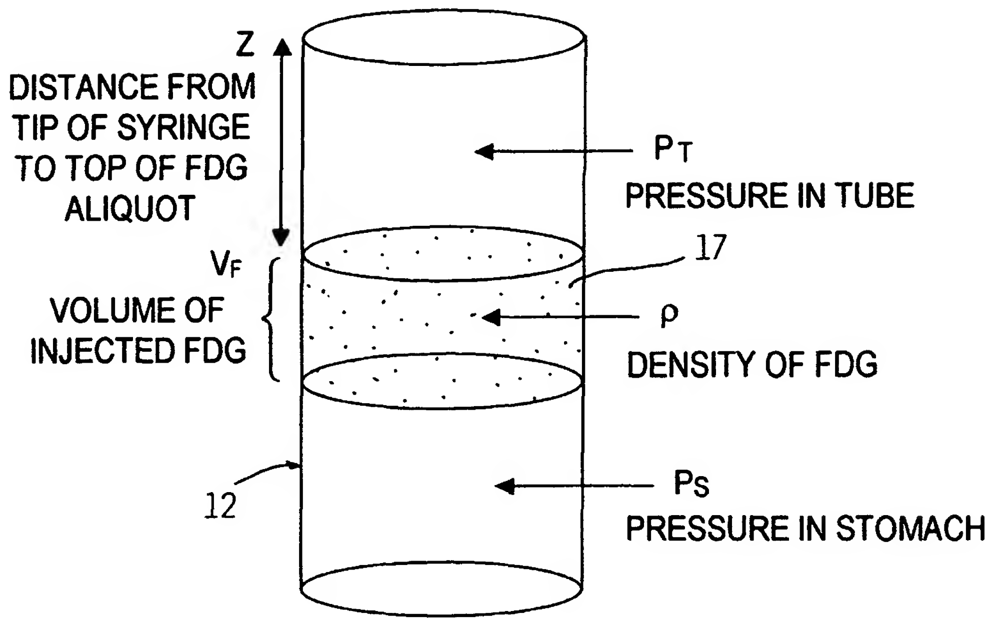


FIG. 3



V_A = VOLUME OF INJECTED AIR FROM SYRINGE

g = $10\ m/s^2$

P_A = AIR PRESSURE $\sim 10^5\ N/m^2$

ρ = ASSUME $\sim 1\ g/cc \rightarrow 10^3\ kg/m^3$

IN EQUILIBRIUM, FORCES ON FDG ALIQUOT ADD TO ZERO:

$$V_{F}\rho g + \pi r^2 P_T = \pi r^2 P_3 \qquad (I)$$

FIG. 4

$$P_T \pi r^2 Z = P_A V_A \qquad \text{(II a)}$$

SO

$$P_T = \frac{P_A V_A}{\pi r^2 Z} \qquad \text{(II b)}$$

SO

$$\underbrace{V_F \rho g}_{\substack{\text{FORCE}\\ \text{DUE TO}\\ \text{GRAVITY}\\ (F_g)}} + \underbrace{\frac{P_A V_A}{Z}}_{\substack{\text{FORCE}\\ \text{PUSHING}\\ \text{DOWNWARD}\\ \text{ON FDG}\\ \text{DUE TO}\\ \text{PRESSURE}\\ \text{IN THE TUBE}\\ (F_T)}} = \underbrace{\pi r^2 P_S}_{\substack{\text{FORCE}\\ \text{PUSHING}\\ \text{UPWARD}\\ \text{DUE TO}\\ \text{STOMACH}\\ \text{PRESSURE}\\ (F_S)}} \qquad \text{(III)}$$

FIG. 5A

AS AIR IS INJECTED, THE ALIQUOT OF FDG MOVES DOWN THE TUBE AND Z IS GIVEN BY:

$$Z = \frac{P_A V_A}{\pi r^2 P_S - V_F \rho g} \qquad \text{(IV)}$$

NOW

$$V_F \rho g \leq (2cc)(1 g/cc)(10 m/s^2)$$

$$\leq 2 \times 10^{-2} N \quad \textit{gravitational force}$$

AND

$$\pi r^2 P_S \sim (3.14)(1.27 mm)^2 (10^5 N/m^2)$$

(ASSUMING $P_S \sim$ AIR PRESSURE)

$$\sim 5.1 \times 10^{-1} N \quad \textit{force from stomach}$$

FIG. 5B

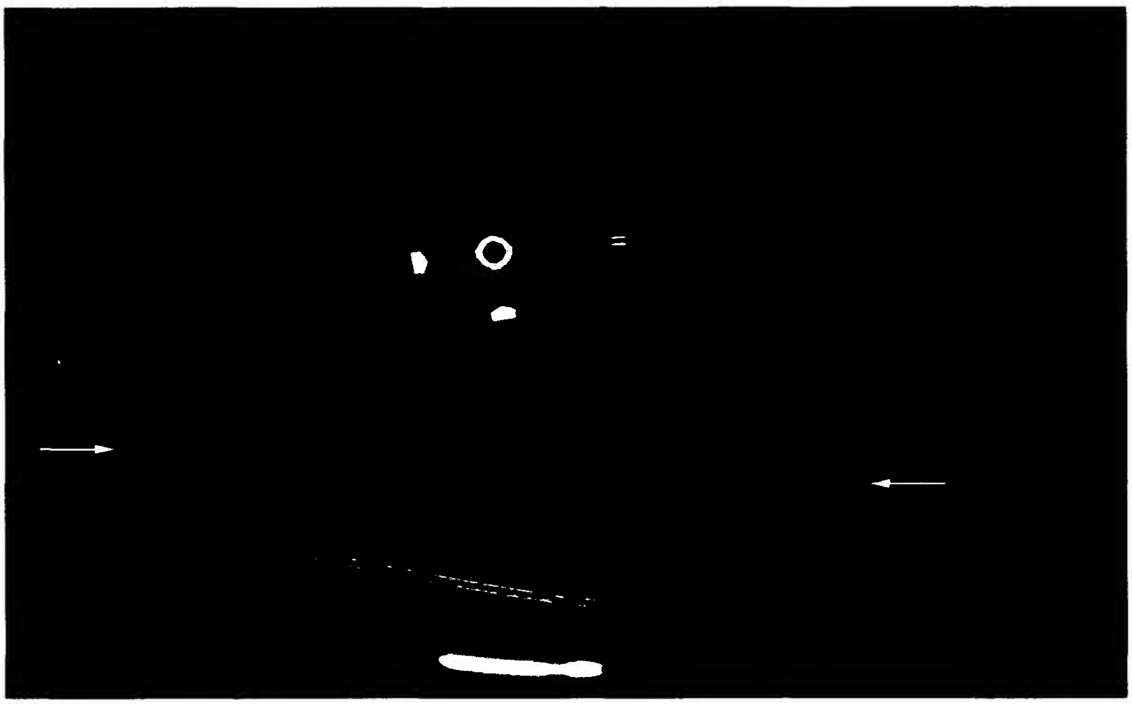


FIG. 6

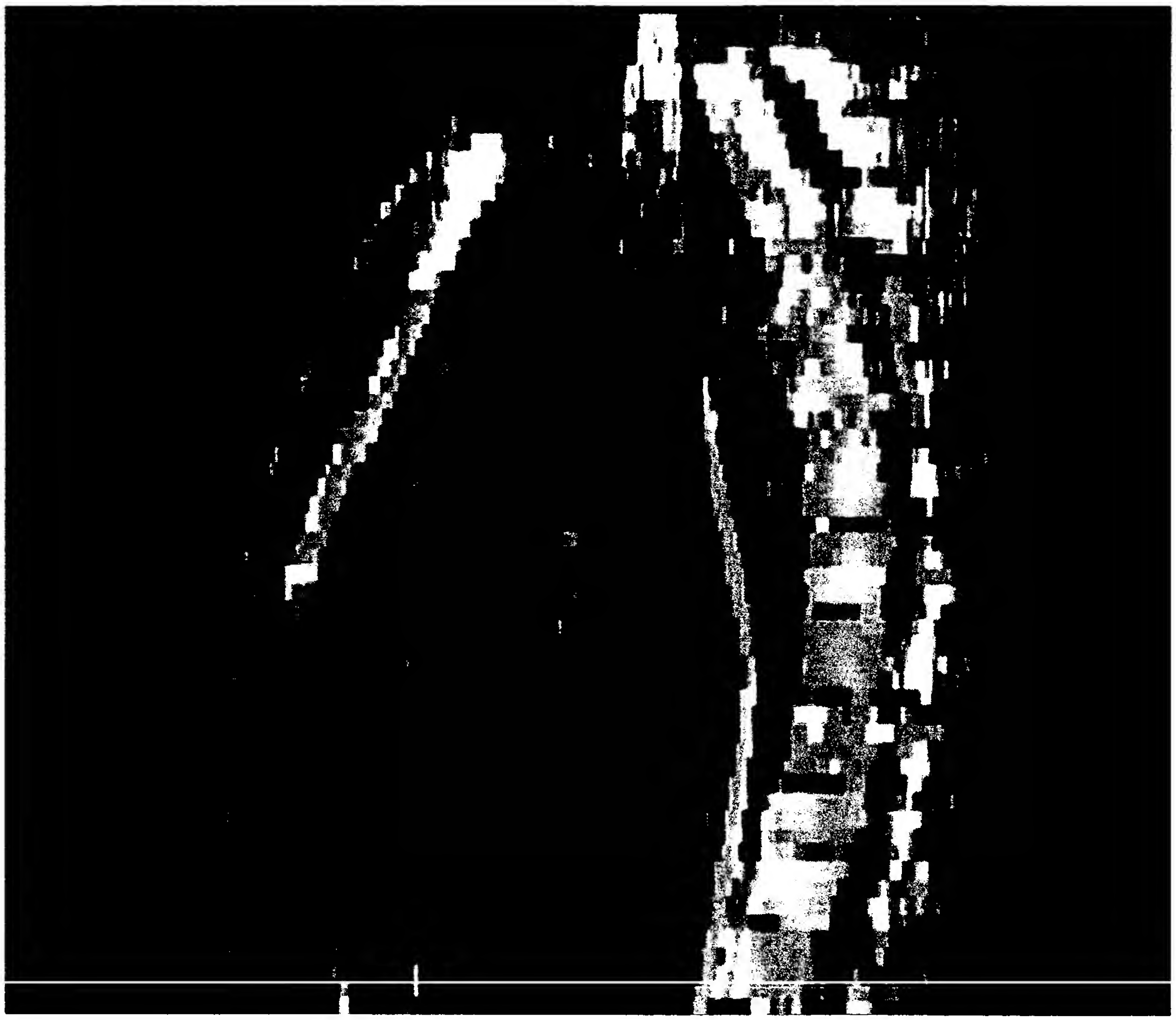


FIG. 7

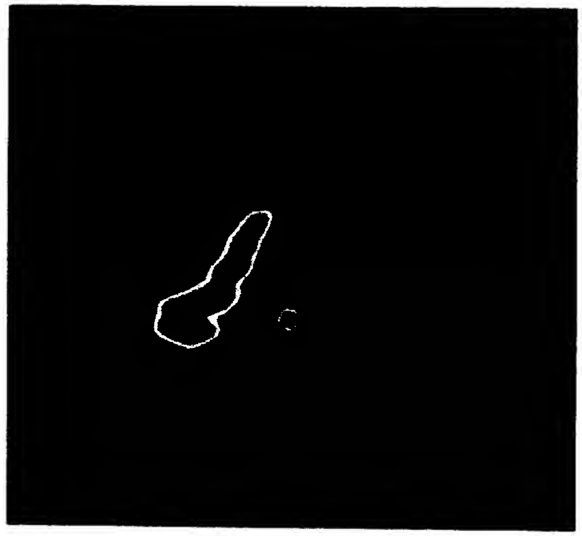


FIG. 8A

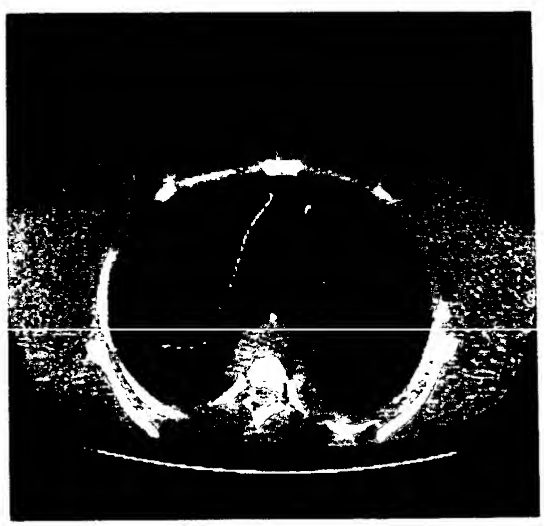


FIG. 8B

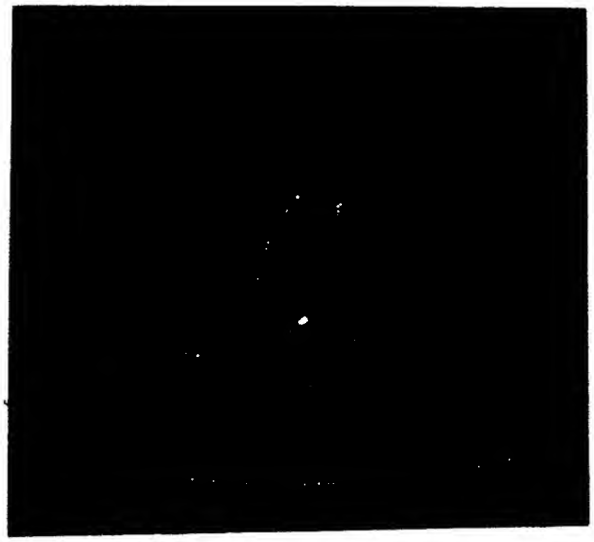


FIG. 8C

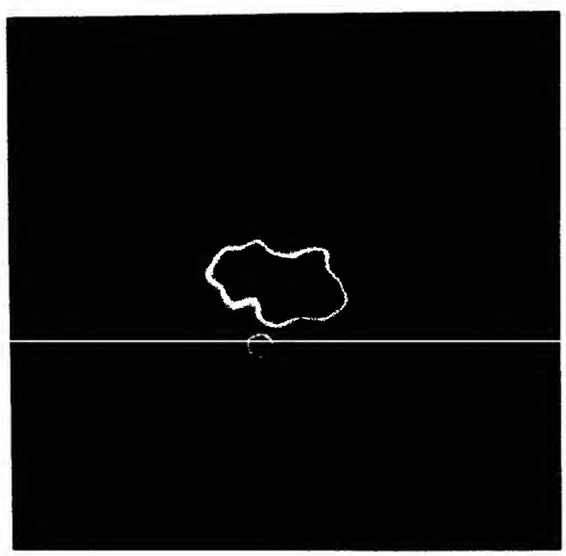


FIG. 9A

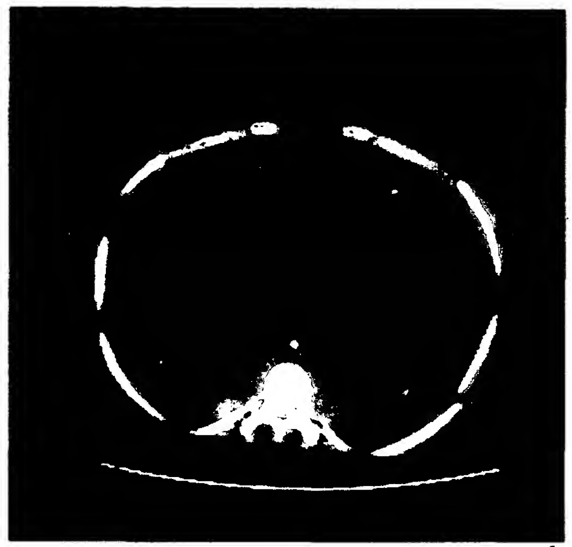


FIG. 9B

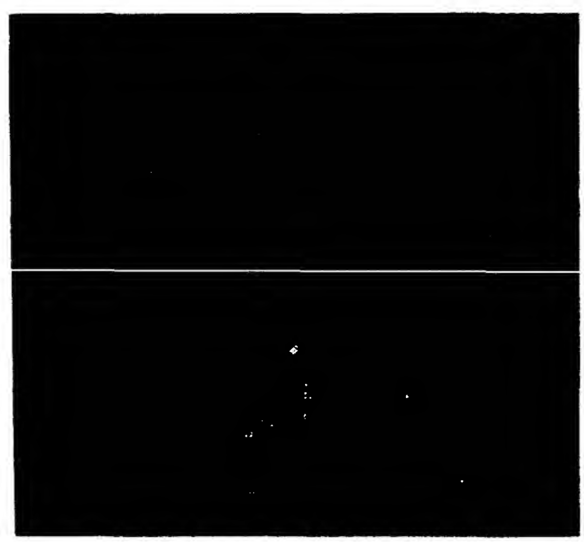


FIG. 9C